

Before the
Federal Communications Commission
Washington D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
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MAIL BRANCH

In the Matter of)
)
Amendment of the Commission's)
Rules to Establish New Personal)
Communications Services)

GEN Docket No. 90-314

ET Docket No. 92-100

To: The Commission

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Comments
on the
Notice of Proposed Rulemaking and Tentative Decisions

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Summary

We applaud the expeditious actions the Commission has taken in the above-referenced Notice of Proposed Rulemaking and Tentative Decision ("NPRM") to implement Personal Communication Services ("PCS") including wireless Local Area Networks ("LANs"). We agree that this action is essential for the deployment of the information infrastructure that will allow the United States to remain competitive in a world where infrastructures of this type are becoming essential elements of economic effectiveness.

Our comments deal with three specific aspects of the proposed rulemaking. The aspects that we address are:

1) The degree to which the rulemaking as proposed supports the Commission's stated objective of enhancing the global competitiveness of U.S industry. Specifically, these comments address the relative importance of voice and data services in achieving this objective.

2) The degree to which the rulemaking as proposed allows for the participation of small business in the use of Emerging Technologies spectrum. Specifically, these comments address the relative importance of licensed and unlicensed services to small business participation in this technical arena.

3) Technical comments specific to the proposed §15.253 and Part 99 rules. In particular, these comments concentrate on concepts related to spectral efficiency, the role of protocol/etiquette and the enabling level of regulation required to achieve a reasonable degree of spectral efficiency.

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Introduction

Knowledge Implementations, Inc. is a small business that supplies contract engineering services. We are currently involved in the analysis of the radio propagation environment and the design of products to provide wireless digital communications among mobile devices in that environment. We have participated in the IEEE 802 efforts to develop a standard for interoperable wireless LANs since 1987 and we currently provide support for the IEEE 802.11 Wireless LAN Project through the participation of our Chief Engineer as Chairman of the Physical Layer Subgroup of that standard's body.

Our work has allowed us to obtain detailed measurements of the complex impulse response of indoor radio channels in manufacturing, office, and retail environments. It has also provided us with the opportunity to generate both simulated and actual prototype solutions to the communications problems presented by those environments.

Issue 1: Specific Considerations with Respect to Global Competitiveness

It was not long ago that a computing device on a desktop was a "tool" that was either impossible to possess or very costly to possess. Telephone communications and conventional mail service provided the communication infrastructure through which the "business" of the U.S.A. was conducted. With the advent of the microprocessor a fundamental change in the way "business" was conducted took place. In the post-microprocessor world documents are transmitted in a timely fashion by FAX, sometimes without ever being placed in hard copy form. Attempts at voice communications that increasingly result in a monolog from a human being to a machine are being replaced by electronic mail ("E-Mail") transmissions. Electronic funds transfer, debit cards and on-line trading in securities are becoming commonplace. Against this backdrop, the premise that providing real time voice services to mobile users is a primary goal of Personal Communication Services ("PCS") should be questioned.

The applications that are enabled by the wireless transport of digital data provide more than mere convenience. In some cases, these applications allow people to perform functions they previously could not perform. In other cases everyday functions are performed more efficiently. E-Mail provides an excellent example. Through the use of E-Mail a worker can time shift his response to requests for information and then service those requests in a sequential and efficient manner when his work schedule permits. This is an example of an everyday function made more efficient. Electronic messages can also contain machine readable data files that allow them to be reused, thus enhancing their communication effectiveness in many applications. This is an example of a function that is not possible using hard copy communications.

In a world in which workers carry penpad sized Personal Digital Assistants ("PDAs") to support work related functions both in and out of the office, a requirement to physically plug this device into another device that serves as a desktop digital assistant for in-office use seems cumbersome. The idea that a student would have a desktop device in the classroom to support his activities in school and a portable device for home use also seems unlikely. In this world, fixed systems will act as data resources for

portable systems and will also provide those portable systems with access to the Public Switched Telephone Network. ("PSTN").

When one reads carefully the petitions that have been filed, that have lead to the current NPRM, the need to seriously evaluate the role of data transport in PCS systems is equally apparent. For instance, the petition for rulemaking submitted by PCN America¹ details a number of "Integrated Futuristic Features" that require image transmission and database access capability that are substantially more challenging to implement than the mobile enhanced Plain Old Telephone Service ("POTS") features described. The petition for rulemaking filed by Apple Computer, Inc.² clearly spells out the role that small portable computers, PDAs as they have come to be known, are likely to provide. These devices will allow access by field personnel to corporate data resources and provide students in our classrooms with access to the educational data resources needed to develop skills to compete in the global marketplace.

To summarize this position, although low cost portable voice service is an interesting possibility for PCS, it is the data transport capabilities of PCS that will enable applications that will result in the gains in economic activity and worker productivity that are hoped for as a result of allocating spectrum to Emerging Technologies. Also, a well designed data transport service can provide a voice transport service more effectively than a voice transport service can provide a data transport service.

Previous comments to the Commission by organizations specifically examining the possibility of delivering wireless data services ^{3,4} have detailed the need for between 40 MHz and 140 MHz of bandwidth. The

¹See Petition for Rule Making, RM-7175, filed by PCN America on November 7, 1989 pages 27-30.

²See Petition for Rule Making, RM-7618, filed by Apple Computer, Inc. on February 13, 1991 pages 5-10.

³See Comments and Reply Comments submitted by IEEE 802 Local Area Networks Standards Committee in GEN Docket 90-314, the "PCS NOI", and to the Commissions en banc hearing on PCS (December 5, 1991).

⁴ See Petition for Rule Making, RM-7618, filed by Apple Computer, Inc. on February 13, 1991 page 20.

actions of the European Community with respect to proposed bandwidth allocations of 150 MHz to HIPERLAN (conforming to the output of ETSI RES 10) support this consensus. The anticipated actions of the Japanese to allocate approximately 150 MHz of bandwidth to wireless LAN applications also supports the consensus that dedicated bandwidth allocations of this size are required. The NPRM as it stands does not meet this requirement. The maximum bandwidth size available is 30 MHz per carrier for licensed operation and 10-20 MHz for unlicensed operation under the proposed allocation structure. Realistically, it appears that the most probable use of the 90 MHz of bandwidth proposed for licensed service will be mobile telephone applications. Even within the unlicensed band, which is only 20 MHz wide, the likely scenario for this bandwidth is that it must be shared with wireless PBX systems intended primarily to carry voice services. Respectfully, it appears that data transport service remains a "poor cousin" to voice transport service when Emerging Technologies are considered in the U.S.A, while our European and Japanese competitors are preparing to exploit the truly revolutionary aspects of Emerging Technologies by dedicating larger bandwidths to data services.

In recognition of the complexity of this situation and the varied interests involved, we comment that the band 1850-1865 MHz and 1930-1945 MHz should be assigned for dedicated use by devices that are primarily intended as data transfer devices. The allocation of this band should allow unlicensed operation within strict limits on transmit power and duty cycle (for instance, 100mw max. and less than 5% duty cycle per mobile) and licensed operation within relaxed limits on transmit power (for instance, not to exceed 10 W and similar duty cycle requirements). **This allocation should be in addition to the proposed allocation of 1910-1930 MHz for unlicensed operation.** Further, we comment that attempts to formalize the channelization of these "Data-PCS" bands at this time are premature and should be left to a future rulemaking. Postponing this channelization will give industry and standards bodies the opportunity to analyze the best possible utilization of this bandwidth and make recommendations regarding the protocol for use of this band.

This allocation of an additional 30 MHz of bandwidth to "Data-PCS" will ultimately not meet the long-term needs of the nation for a wireless

data transport infrastructure. In addressing this long term need it is highly desirable to coordinate U.S. frequency allocations with those of Europe. This will insure a larger market for U.S. manufactured devices. It will also allow U.S. manufacturers to capitalize on work that is currently being done in Europe.

Issue 2: Comments Regarding the Position of Small Business

We applaud the attempts by the Commission to allow small business to participate in the use of Emerging Technologies spectrum. With large businesses contracting in terms of total number of employees, job growth in the economy is increasingly the responsibility of small business. Unfortunately, under any of the licensing proposals being considered the cost of entry will be too high for all but the largest of small businesses or small businesses that are in essence "fronts" for the interests of larger business entities. The only possibility for truly small business in licensed PCS appears to be if a pure lottery allocation of licenses were implemented.

It is clear from the content of the document and from the experiences of the past that such a lottery is unlikely to be the means by which licenses are allocated. In view of this, it appears that the ability of small business to participate in PCS seems largely dependent on the degree to which useful unlicensed operation is permitted.

At this time the quantity of spectrum allocated to unlicensed operation appears to be insufficient to meet the needs of the diverse groups of applications envisioned for this band. The amount of bandwidth allocated also does not provide much flexibility in the approaches that implementors can use to minimize the impact of interference and other communication impediments.

Local Area Network devices historically have provided significant opportunities for small business participation in the emerging markets. If a useful amount of spectrum is allocated to unlicensed operation it is reasonable to expect that small business would be in a position to move quickly to produce devices to capitalize on this allocation. The short product development cycles that are typical of LAN products will result in immediate benefits in the areas of job creation and rapid deployment of Emerging Technology applications.

It is also important for small business participation that the spectrum allocated for unlicensed operation not be "pre-assigned" to particular applications. The channelization of the unlicensed spectrum proposed in the NPRM document appears to effectively "pre-assign" bandwidth to wireless PBX services. This conflicts with the concept that the marketplace should be left to decide on the desirability of various services and that industry should be allowed to determine the best way to implement those services. It is entirely possible that a wireless LAN could act as a supplement to a wired PBX in order to provide a tetherless voice capability to users in a local area. This extension of the functionality of a device that small business can provide, effectively increases the opportunity for small business to participate in Emerging Technologies.

In order to better serve the needs of small business for participation in the Emerging Technology spectrum we comment that additional spectrum should be allocated to unlicensed operation and that this spectrum should not be channelized to meet the needs of a particular industry segment or application.

Issue 3: Specific Technical Comments

We agree with the allocation of frequency in blocks as detailed in §99.405, however, we comment that at least one of the blocks (I, II or III) should be allocated to data service with the opportunity to operate on either a licensed or unlicensed basis depending on transmit level and duty cycle limitations.

We agree with the antennae height and power limitations as they appear in §115 of the NPRM document. We are concerned that the combined impact of systems that operate with the higher power levels described in §116 living within the out-of-band and out-of-service-area emission specifications detailed in Part 99 would be detrimental to devices operating within the nearby unlicensed frequency bands.

We comment that the uses listed in §15.243 (a) for operation in this band should explicitly allow for the use of devices that implement both item (1), the cordless PBX function and item (2) the data communications function, in a common device.

We agree with the specification of frequency stability requirements based on ability of the implementation to ensure that emission mask requirements are met as it is stated in §99.421. We comment that this same type of specification should appear in §15.243 (c) as it relates to frequency stability in the 1910-1930 MHz unlicensed service band. This requirement would be in lieu of a strict requirement to maintain frequency accuracy at 1 ppm.

We comment that it is premature to specify channelization as described in §44 of the 1910-1930 MHz unlicensed operation band. Many techniques that are used to mitigate the impact of the propagation and interference environment depend on the availability of the maximum amount of bandwidth. Further, we comment that devices sharing a common protocol within a common band have the opportunity to provide a higher geographic data handling capacity than can be achieved without a common protocol. It is not clear to us that a properly designed high rate data packet service could not meet the needs of all potential users of this band including those of wireless PBX operation.

We find the limitations on peak power and the measurement of that power as they appear in §15.243 (b)(1)(iv) and §15.243(b)(5) difficult to interpret.

We agree that a certain amount of information can be obtained by monitoring spectrum utilization prior to use as described in §15.253(d)(1), however, we comment that due to substantial variations in signal characteristics over small distances, this information may not be sufficient to detect:

- 1) If a station's transmission will disturb a detected ongoing transmission

- 2) If the ongoing transmission will prevent the pending transmission from being successful.

In this environment it is not clear that geographic data handling capacity will be increased by this approach.

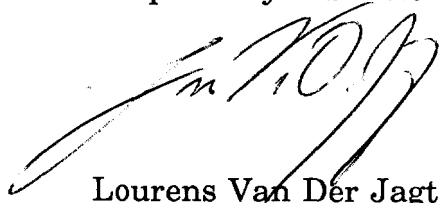
We agree in principle with the normative spectral efficiency requirement as proposed in §15.253 (d) (3),

We comment that although this type of specification may tend to increase the overall geographic data handling capacity of a specific local area through its limitation on transmit power for transmitters with lower efficiencies as measured in Bits/Hz, it is not clear that the overall capacity of a geographic area will be increased by this approach. In particular, the goal of spectral efficiency is to optimize the Mbits/(sec m³ Hz) {Note: Mbits/(sec hectare floor Hz) in the terminology of ETSI RES 10} of a given geography. Coordination among users of this band or the regulatory latitude to implement techniques that increase the number of simultaneous users of a specific local geography is essential to accomplishing this goal. An additional specification penalizing the duty cycle of a given transmitter for spectral inefficiency would seem to move the rulemaking closer to achieving this goal.

Conclusion

In these comments we have attempted to point out the serious need to have the role of data services in the Emerging Technologies bands emphasized. It is our opinion that a data-oriented wireless infrastructure will provide the backbone on which future economic growth will be based. In light of this opinion, it appears to us that the NPRM as it currently stands provides too much emphasis on another generation of wireless voice service and not enough emphasis on truly Emerging Technologies. We have specifically commented that additional bandwidth should be allocated on a dedicated basis to data transport applications and unlicensed operation. We have also commented on a number of technical specifications that have been presented and have requested that the Commission not regulate the manner in which the unlicensed bands be channelized at this time.

Respectfully submitted,



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